

characteristic of this species, is obvious. Each feather is worked into the flax of the mat.

No. 3. A mat of wing-feathers of the Kaka (*Nestor meridionalis*), made by the natives near Wellington.

The following papers were read:—

1. Description of the Skull of a Species of *Xiphodon*, Cuvier.

By WILLIAM HENRY FLOWER, F.R.S., F.Z.S., F.G.S.,
&c.

[Received November 16, 1875.]

(Plate I.)

The Hon. Auberon Herbert has lately presented to the Museum of the Royal College of Surgeons a fossil cranium which merits description, as in some measure assisting to fill up one of the still innumerable vacant spaces in the vast and complex history of living beings, a history gradually, slowly, but no less surely, being reconstructed by the united labours of explorers and palæontographers in all parts of the world.

In some respects, the specimen is provokingly unsatisfactory for the purpose, partly from its own incompleteness, but especially in the absence of certain knowledge as to its locality and geological antiquity. As it had passed through several hands before it came into Mr. Herbert's possession, there is no external history belonging to it, except a traditional statement that it was found in the neighbourhood of Woodbridge, in Suffolk.

At first little more was to be seen in it than an ovoid mass, nearly nine inches long, of dark grey, very compact, micaceous sandstone, with the surface smoothly rounded, and almost polished, evidently by the action of water. To a superficial observer it might have passed for a large rolled pebble; but closer examination showed that, besides having the general form of the head of an animal, the surface here and there presented darker patches, having a distinctly bony structure, which, from their situation and form, plainly revealed the general outline of the cranium within.

After a considerable amount of trouble, the closely adhering enveloping matrix was completely cleared away. The specimen was then shown to consist of the almost entire cranium (skull without lower jaw) of an animal of the size of a small sheep, with all its cavities and external depressions filled up with a matrix of the above-described sandstone, and then so rolled as to wear down some of the most prominent parts, as the zygomatic arch and, unfortunately the whole of the crowns of the teeth; for the palatal surface was exposed, smooth and polished, and the dental characters are only indicated by the alveoli or by roots worn down to the level of the surrounding bone. This is a very great loss, more especially as it is mainly by the form of the enamelled crowns of the teeth, generally

better preserved than any other part of the body, that extinct forms of the group to which this one is allied have been characterized. The anterior portion of the skull has also been broken off close to the premaxillary suture, and consequently is wanting in the specimen.

Before proceeding to the description of the skull, the question naturally arises—What inference can be drawn from the condition of the fossil and its matrix as to its probable origin? Several experienced palæontologists to whom it was shown while still partially imbedded, declared that they knew of no fossil remains in a corresponding condition; and on comparing it with all the Mammalian specimens from every part of the world, contained in the British Museum, not one was found agreeing with it.

It certainly approximates very nearly in most of its characters to the curious "box stones" of the Suffolk Crag, to which Mr. Ray Lankester directed attention in the 'Quarterly Journal of the Geological Society' for 1870 (p. 499), though less ferruginous in colour than they generally are. If this suggestion should prove to be correct, it will confirm the indication as to locality mentioned above. The "box stones" are evidently waterworn aggregations of sandstone, generally, though by no means invariably, surrounding some organic body, and are remnants of a broken-up formation of an earlier age than the Red Crag in which they are now found. They are considered by Mr. Lankester, from a comparison of the molluscous fossils found in them, to be of "Diestien" age, or approximately equivalent to the so-called "Black Crag" of Antwerp; but, as will be mentioned hereafter, the zoological characters of the present specimen indicate a much greater geological antiquity.

The skull is that of a rather young animal, as shown by the still open suture between the basioccipital and the basisphenoid bones; but (at least in the case of existing Ruminants) this sign of immaturity remains some time after all the permanent teeth are in place, as appears to have been the case in the present specimen.

The cranium differs most notably from that of all existing species of Ruminants in the breadth and flatness of the frontal region between the orbits, the sudden contraction behind the orbits, and the large extent of the temporal fossæ, which is increased by well-marked sagittal and occipital crests. *Hyomoschus* is that to which it comes nearest; indeed, if we could imagine a larger animal of the Traguline type (*i. e.* an animal with a more lengthened head, and greater surface for the implantation of teeth and for the attachment of muscles, without corresponding increase of size of the brain-cavity and orbits—the modifications, in fact, which always occur in larger, as compared with smaller, members of a natural group), we should obtain a form closely resembling the present skull. Its special peculiarity would still be the flatness and width of the interorbital region above, in consequence of which the cavities of the orbits look directly outwards, instead of upwards and outwards as in *Hyomoschus*.

The sides of the face in front of the orbits are flat, as in the Tragulidæ and in many true Ruminants, without any sign of depression for a suborbital gland; but further forward, commencing just be-

hind the large infraorbital foramen, is a wide and deep oval depression, extending over the whole of the region above the premolar teeth. Indications only of such a depression are seen in the Tragulidæ. There is no vacancy at the point of junction between the nasals, maxillæ, lacrymals and frontals, as in so many Cervidæ and Antelopes, and as is slightly indicated in *Hyomoschus*, though not in *Tragulus*. The sutures bounding the lacrymal bone, and between the maxilla and malar, are beautifully marked by deeply indented and wavy lines; but the premaxillary suture cannot be distinguished, being probably situated anteriorly to the point of fracture of the skull. The supraorbital foramina are not very large, and are placed in depressions rather nearer the middle line than the margin of the orbit, on a level with the anterior angle of that cavity; and, as in many existing Artiodactyles, a groove is continued forwards from them.

The posterior margin of the orbits, if, as is probable, they were originally complete, have been broken away, as has the entire zygomatic arch.

Turning to the base of the skull, the occipital condyles are lost; but the greater part of the basioccipital, with its pair of prominent tubercles, remains. On each side of this the oval form of the bases of the large auditory bullæ can be distinctly made out, though they have been worn level to the rest of the surface of the skull. Their interior, however, can be seen to be filled with a fine network of cancellar tissue—a character common to the Suidæ, Tragulidæ, and Camelidæ, and absent in nearly all the true Ruminants. On the lower surface of the skull, as well as above, the elongation of the middle region is a conspicuous feature.

The hinder margin of the palate is produced backwards to the extent of fully three quarters of an inch beyond the notches on each side; but as its edge has been broken off, it is impossible to describe its true form.

Between the teeth the surface is long, narrow, and depressed along the middle line. There is no sign, even at the anterior fractured edge, of the incisive foramina, which must consequently have been small; but there is a conspicuous foramen opening forwards near the outer edge of the palate opposite the second premolar tooth, and placed rather more posteriorly on the left than on the right side.

The alveoli, in most of which broken roots of teeth remain, form a continuous series along each side of the palate, as far forward as the line of fracture. Posteriorly they have been so much injured that their form and number cannot be made out with perfect certainty; but they appear to indicate teeth of the following character.

Beginning at the hinder end of the series, there are three molars, with four roots, wider transversely than from before backwards. The most anterior of the three must have been considerably smaller than the other two, which appear to have been nearly equal in size. In front of the molars there are seven roots, rounded or transversely elongated, placed in a single line, and nearly equidistant, indicating a series of compressed teeth, each with an anterior and a

posterior root. Unfortunately the region in which the posterior of these teeth is situated is most damaged, and its form cannot be clearly made out; but, judging from the analogy of *Cænotherium*, *Xiphodon*, and allied forms, we have here the whole premolar series, the last having two external, and one internal root, obliterated in the specimen, and each of the others two roots only. The canines would thus be the teeth next beyond the line of fracture; but they evidently could not have been large, or deeply implanted, as in *Tragulidæ*. Of the incisors, nothing can be said from actual knowledge; but all analogies of allied forms lead to the supposition that the complete number (three on each side) were present.

It is evident that the animal to which this cranium belonged was a member of that group of Artiodactyles in which the general form of the modern Ruminants was shadowed out, but in which the typical number of teeth (eleven on each side, above and below, in continuous series) was still maintained, a group largely represented in the North-American Miocene strata by *Oreodon* and its allies, and of which the elegant little *Cænotherium* is one of the best-known European forms.

It differs, however, considerably in general form and proportions from any of the former as figured by Leidy, especially in the absence of a suborbital fossa, and is readily distinguished from the latter by the want of the deep median notch in the hinder edge of the palate, and by the more compressed form of the premolars, as estimated by the size of the roots. I am unable, however, to point out any character by which to separate it from Cuvier's *Xiphodon*, constituted in the 'Ossements fossiles' as a subgenus of *Anoplotherium*. From the type of that form, *X. gracilis* of the Paris Upper Eocene, it differs, as far as can be inferred from descriptions and figures, chiefly in superior size, being about one third larger.

Another form to which it is closely allied is known as a British fossil from the Upper Eocene of Hordwell Cliff, having been described by Professor Owen under the name of *Dichodon cuspidatus**.

This animal is known by the teeth alone; and it is singular that, as far as the comparison of the size and shape of the roots or alveolar walls will allow, there is no reason why the teeth of *Dichodon cuspidatus* should not have belonged to our present specimen. Although there is not yet evidence enough to be assured of their identity, and more perfect specimens of either may show that the idea is fallacious, I yet think it necessary to point out the possibility. But then there are grave doubts, as already expressed by Gervais †, whether *Dichodon* is really separable generically from *Xiphodon*. The main character on which the genus was founded, the peculiarity of the last lower premolar tooth, was, as the original describer himself subsequently pointed out, simply the result of a milk-tooth having been mistaken for a permanent one ‡. The British species attributed to the

* Quarterly Journal of the Geological Society, vol. iv. 1848, p. 26.

† Zoologie et Paléontologie Française, 2^me édit. (1859), p. 159.

‡ Quarterly Journ. Geol. Soc. vol. xiii. (1857), p. 190.

genus *Dichobune* are also considered by Gervais to be more properly Xiphodons; so it is perfectly clear that a more careful comparison than has yet been made will be necessary to determine the claims of either to generic distinction.

Being always strongly opposed to the multiplication of generic designations without very adequate grounds, I shall be content in the present instance, to retain the Cuvierian name *Xiphodon**, and, in the absence of any certain evidence that it belongs to any of the previously described species, to distinguish it as *X. platyceps*.

It may be added that all the species with which it is most nearly related, found both in England and France, belong to the Upper Eocene epoch, or "proocene" of Gervais.

The principal dimensions of the cranium are as follows:—

	inches.	centin.
Length, in its mutilated state	8·2	20·8
(About 9 inches if perfect.)		
From anterior margin of orbit to occipital crest	5·3	13·5
From anterior margin of orbit to infraorbital foramen	1·5	3·8
Breadth of upper surface of skull between orbits	2·8	7·2
Greatest parietal breadth	2·4	6·1
Breadth at anterior part of temporal fossa	1·8	4·6
Height of skull (between frontal region and hinder part of palate)	2·6	6·6
Height of orbit	1·3	3·3
Length of molar and premolar series	3·7	9·5
Breadth of palate between posterior molars	9	2·3
„ „ between middle premolars	1·1	2·8

2. On a New Ziphioid Whale. By JULIUS VON HAAST, Ph.D., F.R.S., Director of the Canterbury Museum, Christchurch, New Zealand. Communicated by Prof. W. H. FLOWER, F.R.S.

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In the month of May of this year the Canterbury Museum received from W. Hood, Esq., of the Chatham Islands, three skulls of Ziphioid Whales taken from specimens stranded with about 25 others during the summer of last year on the Waitangi beach of the main island of that group.

They were described as "blackfish," all belonging to the same school, by my informant, who moreover believes that the whole series belonged to the same species.

* Not, however, as a subgenus of *Anoplotherium*, from which it is perfectly distinct.